

**SOUTHERN CALIFORNIA
DEMAND SIDE MANAGEMENT
NATURAL GAS COOLING PROGRAM
PROPOSAL**

Submitted By

American Gas Cooling Center

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Program Overview

The American Gas Cooling Center (AGCC) is pleased to submit this proposal to the California Public Utilities Commission for implementation of the Natural Gas Air Conditioning Program. This program will promote zone control, hybrid and integrated HVAC systems, capable of running on either electricity or natural gas, for installation in residential and nonresidential new construction projects. The program will promote these technologies through a mix of manufacturers' incentives, demonstration projects, and education directed to builders, designers, HVAC contractors and installers, and commercial and residential customers. Requested program funding is \$5.6 million to come from the \$56.5 million in utility surcharge funds allocated to local non-utility programs. The funding support for this proposal should be proportioned based upon the percent of funds provided by each utility represented in southern California. The percentages are 58% Southern California Edison, 24% San Diego Gas & Electric and 17% Southern California Gas.

AGCC estimates first year savings of 16,300,000 kWh and 8,700 kW. Second year results are expected to grow as more specifiers and consumers become aware of the natural gas cooling option. Second year results are therefore expected to produce savings of 17,200,000 kWh and 9,200 kW. Natural gas cooling equipment life expectancy of 20 years expands these savings into the future. The AGCC approach to ensure the results can be obtain is accomplished through new installation techniques that make use of the uniqueness of gas chiller capabilities and partnering with manufacturers to provide consumers a choice of long-term warranty, extended maintenance or cash incentives.

The use of zone control, hybrid and integrated systems provide consumers the design flexibility, fuel diversity and overall operating control necessary in today's energy market. The natural gas cooling program proposed by AGCC will focus on the benefits these new system approaches provide consumers in meeting their HVAC requirements. New zone control features provided through natural gas cooling also provide consumers an added advantage of controlling specific spaces with limited energy use equipment. The AGCC proposal is aimed at providing maximum consumer benefit with maximum energy savings using the best of natural gas or combined electric cooling for new construction applications.

The overarching program objective is to maximize short- and long-term energy and peak demand savings by supporting the market for high-efficiency natural gas cooling equipment in the commercial and residential markets. The effort will focus on new construction for residential, small commercial and large commercial developments that have not already specified air conditioning equipment. The program is supportive of new natural gas air conditioning equipment that provides the highest level of efficiency available for gas cooling applications. The program also promotes awareness of new emerging natural gas air conditioning. Fuel switching from electric to gas or gas to electric is prohibited and disallowed.

Qualifying units for residential and small commercial applications must be greater than or equal to three tons in size and have a minimum coefficient of performance (COP) greater than or equal to 0.62. At this time, several manufacturers have products that meet program requirements and have a demonstrated history of reliable service in the field: Robur/Servel, Goettl, Mitsubishi, Yazaki, Broad, Tecogen and Cooling Technology. Large commercial equipment must have a coefficient of performance (COP) greater than 1.0. Direct-fired double-effect, steam-fired double-effect, or gas engine units manufactured by several companies meet or exceed this requirement.

The program will develop the market infrastructure for gas cooling technologies through a collaborative relationship between AGCC and equipment manufacturers. Manufacturer participation in the program requires their support of customer service through dealer training and incentives aimed at stimulating sales and service personnel. In this way, the program will strengthen “upstream” service delivery channels (e.g., distributors, retailers, and builders) and expand their capability to promote, advertise and distribute energy-efficient products. In doing so, the program will expedite commercialization of emerging technologies, and extend their availability to under-served small nonresidential customers.

The program incorporates a “push-pull” approach. The program will stimulate supply via incentives and other coordinated activities with manufacturers and distributors (the “push”). Manufacturer incentive participation is required for equipment to qualify for program incentives. The program will stimulate demand by educating builders, designers, HVAC contractors and installers, commercial and residential customers about the benefits of emerging, hybrid and integrated natural gas cooling systems (the “pull”).

The reaction of consumers to SoCalGas’ 2001 program and a Gas Research Institute survey makes it clear that the concept of natural gas air conditioning is foreign, yet exciting to customers. Over 70 percent of those responding to a GRI survey were unaware of natural gas cooling equipment, demonstrating the need for consumer information, education and product incentive to stimulate interest. Excellent progress was made in 2001, as evidenced by the number of demonstration and gas cooling units installed within SoCalGas service territory. However, more information and education is needed for consumers to become aware of this alternative cooling technology. The AGCC program is designed to stimulate product demand by further increasing vendor, designer, and customer awareness of energy-efficient natural gas air conditioning systems. Program coordination with our national promotional efforts is expected to increase manufacturer interest in these products and the California HVAC markets.

Increased demand, spurred by improved information, education and incentives, should stimulate the manufacture of a greater number and variety of energy-efficient space conditioning products at lower prices. Market effects based on increased awareness and knowledge of energy-efficient products and their benefits are likely to need continual reinforcement until customers, vendors, and manufacturers can make changes in their organizational and specification practices. Once these changes are institutionalized, they should sustain themselves for several years. Market effects sustainable in the long run are those that result in products with high quality, reliability, and variety at competitive costs.

Introduction of these products will assure the maximization of long-term energy and peak demand savings.

Program Proposal Summary

Program Name	Natural Gas Air Conditioning Program		
Program Category	Local Cross-Cutting Programs		
Program Year	2002	2003	Total
Budget	\$2,769,000	\$2,829,000	\$5,598,000
TRC-Societal NPV	1.11	1.09	1.10
Participant NPV	1.32	1.28	1.30
Annual kWh Savings Target	16,382	17,248	33,630
Annual Peak kW Reduction Target	8700	9200	17,900
Annual Therm Savings Target	(1,580,000)	(1,600,000)	(3,180,000)
Other Performance Targets	Number of manufacturer- certified contractors Number of demonstration sites Number of seminar attendees		
Program Strategies	Upstream Program		
Target Market Segments	Commercial New Construction Residential New Construction		

Program Rationale

The future of energy rates and the impact of electric industry restructuring remain uncertain. For the foreseeable future, California remains vulnerable to electricity outages and price spikes stemming from peak demand exceeding supply. Commercial consumers can shield themselves from the effects of outages and higher prices by relying on hybrid or integrated cooling systems that can base load on natural gas during periods of peak electricity or base load on electricity during periods of peak natural gas demand. Hybrid and integrated systems divide a building space conditioning requirement into a percentage of gas and electric equipment. Therefore, a building air conditioning requirement of 100 percent can be divided into 50 percent gas and 50 percent electric air conditioning or any other acceptable percentage needed to achieve system flexibility and fuel diversity not obtainable with a single gas or electric specified system. Commercial customers who receive accurate price signals from mechanisms such as seasonal, time-of-day rates or real-time pricing are particularly well positioned to benefit from hybrid/integrated systems through a new system that provides them control over energy costs. Hybrid/integrated customers have the ability to shift some portion of the air conditioning load to the non-peaking gas or electric equipment, thereby reducing peak demand.

Hybrid/integrated systems also provide commercial owner/operators the ability to manage their energy costs more effectively through HVAC load shifting and reduction of peak loads associated with HVAC. The relatively low gas energy prices, flexible energy contracts and convenient HVAC maintenance and service agreements all point to incorporation of high-tech gas cooling equipment in HVAC system design. Despite higher installation costs, hybrid gas-electric systems offer low operating costs, rapid payback on equipment, and economical life-cycle costs.

Residential consumers also have a unique opportunity to gain greater comfort and reduced equipment and energy costs through zone control techniques when applied to new construction using gas chiller air conditioning. Natural gas chillers use water to transmit cooling to various locations and can be divided into the appropriate tonnage to fit the area or room requirement for cooling. Electric direct expansion (DX) equipment requires a separate electrical compressor or DX unit for each zone. A zone control system accurately tracks room loads that correspond with daily activities and external temperatures providing consumers total ambient comfort in each zone in their home at any time of day. The system also provides design flexibility that easily conforms to room configurations, providing cost-effective comfort for today's lifestyle. Therefore, a five-ton gas chiller divided into separate zones provides consumers greater comfort, increased energy savings and lower cost of installation.

Incentives are targeted at reducing peak coincident demand occurring during the hottest weather, and therefore directly attacking the problem of peak demand power outages. Incentives are also used to increase the awareness of natural gas cooling systems that can provide consumers alternative air conditioning. In addition, once equipment is installed under the incentive, a 20-year life is expected.

Market Barriers

Equipment capital cost.

The increased capital costs of higher-efficiency gas cooling models, zone control and hybrid systems limit customer demand because customers lack information on the extra value supplied by the more efficient equipment and are uncertain about its future performance. Lack of experience with the higher efficiency equipment prevents most builders and small commercial customers from requesting such technology, which discourages distributors from stocking it, which deters mechanical engineers and vendors from specifying higher efficiency equipment. The result is decreased availability and increased prices.

Service unavailability.

Following a 30-year absence of gas cooling from the residential and small commercial markets, builders and contractors have grown unfamiliar with the unique aspects of gas cooling installation, such as hydronics and plumbing. Lack of qualified technicians discourages decision-makers from adopting gas cooling for cost-effective applications. In cases where decision makers persevere in choosing gas, they face two obstacles: first, from fear of losing a bid award, contractors and installers will attempt to "bluff" their

way through an installation, resulting in a faulty system installation. Second, in an attempt to cover unfamiliar expenses, contractors and installers will inflate the price of their bids, to cover their own uncertainty resulting in the consumer paying an inflated price.

Product awareness.

The lack of success for natural gas cooling is somewhat attributable to the lack of awareness specifiers and consumers have for the new more efficient equipment. A Gas research Institute (GRI, now Gas Technology Institute) survey indicated that 70 percent of those surveyed did not have enough information to comment on gas cooling. Of the value chain members surveyed, 87 percent of the Architects and Engineers (A&E's) and HVAC contractors lacked sufficient knowledge to specify gas cooling. Consumers were equally uninformed with 53 percent of the education, health care and offices respondents unaware of this alternative for space conditioning.

Program Response

This program aims to reduce the high cost of natural gas cooling through hybrid/integrated and zone control system and installation techniques. A mix of education, demonstration projects, and manufacturer incentives are used to mitigate the risks of those early adopters trying the technology for the first time. Providing specifiers and engineers the information and education on hybrid/integrated systems and installation techniques eliminates the fear often associated with new approaches resulting in high prices for design and installation. AGCC also expects to improve supplier/dealer willingness and ability to market and install such products, increase the demand for higher-efficiency natural gas air conditioning equipment, and thus drive down capital costs.

Energy-efficient natural gas cooling installation and maintenance technologies are well within the abilities of most capable contractors and installers. However, due to the long absence of gas cooling from the residential and commercial markets, much of this product-specific knowledge has been lost. Proper installation and service of gas cooling is the Achilles' heel of long-term equipment reliability. Lack of product-specific installation and service knowledge has resulted in higher consumer prices and equipment being replaced before the end of its useful life. Numerous installation difficulties can be avoided with proper training or education. It is the intent of this program to re-educate the building and installation professionals on this lost knowledge and introduce emerging techniques associated with new and advanced energy-efficient natural gas cooling systems.

The awareness of natural gas cooling benefits and advantages as an alternative HVAC system is a key effort in this proposal. A variety of activities will be used to educate architects, engineers, specifiers, operators, owners, dealers and consumers of the new gas cooling alternatives. AGCC will cosponsor a conference and exhibition of gas equipment with the Department of Energy, Association of Energy Engineers, SoCalGas, and manufacturers. The AGCC magazine "Energy Solutions" will be provided to key specifiers of HVAC and owners. Case studies reviewing successful gas cooling

installations and techniques are provided to specifiers and owners as testimony to success achieved in energy and cost savings. New web-based training programs will provide dealers and installers up-to-the-minute knowledge of gas cooling systems. Direct contact with specifiers, builders, developers and dealers will provide support material, training and information about the latest equipment or technique. Technology transfer workshops and seminars are provided to residential and commercial owner, operator and specifier on the gas cooling alternative.

Program Objectives

The objective of this program is to stimulate product demand by increasing knowledge and awareness of hybrid/integrated and zone control gas cooling strategies that include advanced energy-efficient natural gas cooling (an emerging technology for small commercial and residential use), thus maximizing short-and long-term energy and peak demand savings. The program targets hard-to-reach residential consumers outside the LA Basin, multi-family and non-English speaking households where new zone control techniques can be applied. The program also targets small hard-to-reach commercial customers outside the LA Basin, businesses with less than 10 employees or tenants of retail strip malls that can apply hybrid, zone control or integrated systems. Existing gas air conditioning unit replacements are considered but at a lower level of incentive. The program will attempt to reduce the southern California market's reluctance towards installation of energy-efficient natural gas cooling equipment as part of an advanced cooling system using new equipment and installation techniques. The focus is to provide owners the information and education to select new efficient gas cooling equipment and provide new installation techniques to better control their energy and equipment costs.

Program Innovations

American Gas Cooling Center will work closely with local utilities, Department of Energy, American Society for Healthcare Engineering, and other leading consumer groups to increase product awareness and demonstration participation. Manufacturer participation is essential for the effort to reach niche markets and provide the support and service required for equipment longevity. New web-based training is provided on-line through AGCC's Internet site, www.buildingenergy.org reinforcing seminars, workshops and office briefings. Larger commercial specifiers are provided DOE II or project assessments to demonstrate gas cooling cost effectiveness for new construction projects. Incentives provided to builders and owners focus on low life-cycle cost through long-term warranty protection or preventative maintenance or equipment buy-down that provides consumers a choice based on what is most important to the buyer.

Marketing and Outreach Plans

AGCC has successfully collaborated on marketing and outreach activities with partnering investor-owned utilities, Department of Energy, and Oak Ridge National Lab since 1990. AGCC will design an easily understood education program for members of the design community, residential builders, and HVAC dealers and installers, drawing from its vast file of engineering manuals and technology transfer workshops. The program will reach out to target audiences via seminars, conferences and briefing sessions. The education program will focus special attention on small commercial dealer and service providers to support customer equipment installations. The program will partner with product manufacturers to incorporate into education programs detailed information and technical assistance regarding proper sizing and high-efficiency operation and maintenance procedures. A key component of this program will involve visits to existing demonstration sites to validate the feasibility and cost effectiveness of energy-efficient natural gas air conditioning systems.

AGCC case studies on successful installations will be prepared to provide consumers, specifiers and builders local uses of gas cooling technology and installation techniques. Energy Solutions magazine will be sent to top designers, specifiers and owners. The magazine provides the latest successes and new equipment advances for gas cooling technology achieved nation-wide.

AGCC will host seminars at utility Energy Centers or at convenient customer locations. Since travel will dissuade some key market actors from participating, the program will also conduct a series of briefing sessions at the offices of key mechanical engineers, residential builders and developers, and HVAC dealers and installers throughout southern California. New web-based training is provided on line through AGCC's Internet site www.buildingenergy.org reinforcing seminars, workshops and office briefings. In addition to program seminars developed in-house, AGCC will seek support from local utilities for accommodations and meeting supplies for manufacturers to conduct HVAC technical training sessions for mechanical engineers and equipment dealers.

AGCC will also sponsor on-site training and assistance for the installation of natural gas cooling in the under-served residential markets such as senior assisted living centers, multi-family or low income housing projects to further encourage technology acceptance. AGCC will partner with equipment manufacturers and qualified installers to provide knowledgeable installation assistance at specific project sites. AGCC will make use of builder, developer and dealer briefing sessions on new equipment and techniques to inform and educate potential consumers of advancements. Brochures on product options, performance and safety are provided. Case studies are used to review specific applications and installation techniques with owners or developers before final decision. Group presentations are made to inform potential users of gas cooling equipment options for HVAC.

AGCC will design and implement a mass communication plan to inform residential and small commercial customers about the efficiencies, features, and benefits of hybrid and zone-control cooling systems that incorporate natural gas air conditioning, thus generating greater acceptance of and demand for the technology. Presentations are made to professional groups, hospital and school administrators and interested consumer groups. Energy Solutions magazine is used to inform and educate professionals on successful gas cooling applications and techniques quarterly. Key mechanical engineers and architects will be contacted to provide detailed information on new gas cooling products and applications. ME's are provided DOE II or similar calculations on new commercial projects that demonstrate the use of hybrid or integrated system applications. AGCC Internet site provides up to the minute changes in equipment through direct ties to manufacturers. The site also is used to provide web-based training of dealer, owners or operators on new gas cooling equipment.

As natural outgrowth of these education efforts, AGCC will obtain leads for customers interested in installing gas cooling systems at their own facilities or new construction projects. The Center will communicate leads to an appropriate manufacturer or distributor for immediate action. Other direct customer, builder or developer contacts should also provide manufacturers with leads on potential new equipment installations.

AGCC will partner with manufacturers to leverage outreach efforts and provide consumers the latest in technology advances and installation techniques. Manufacturer partners are required to participate in certain aspects of the program for their equipment to receive full support. Supporting partnerships with local utilities and others will be sought to expand outreach efforts and assure program objectives are achieved as designed. Partners will be sought for conferences, presentations and training seminars to specifiers and dealer organizations. Manufacturer partners are required to participate in incentives to further reduce consumer cost of installation thereby creating greater interest in new thermally active equipment.

Procedures for Equipment Purchase or Installation

Residential New Construction

Several manufacturers have products that meet program requirements and have a demonstrated a history of reliable service in the field: Robur, Goettl, and Mitsubishi Heavy Industries, Yazaki, Broad and Tecogen. Cooling Technology is an emerging product that is scheduled for market entry in the summer of 2002. Ambian is scheduled to introduce a new five-ton heat pump and chiller in spring of 2003. Robur and Cooling Technology are the primary suppliers of three- to five-ton absorption cooling for single family residential new construction homes that focus on zone control techniques. Robur offers the Serval gas absorption chiller in three- and five-ton units. A chiller/heater is also available from Robur for both heating and cooling. Cooling Technology will offer Cooltec five-ton absorber, chiller heater or chiller link in this market. Single family new construction projects or existing gas cooling equipment scheduled for replacement qualify under this program element. The program will seek installation and demonstration of natural gas air conditioning in under-served residential markets outside the LA Basin, multi-family or non-English speaking households defined in the "Statewide Residential

Customer Needs Assessment Study”. AGCC expects that a minimum of 1250 tons will be specified or installed the first year. Year two is expected to increase by an additional 250 tons to 1500 tons.

Multi-family and larger residential new construction projects will have more equipment choices in this relatively untapped market. Robur already has a chiller link of up to 25 tons available. Goettl offers the Comfortquest gas engine driven heat pump that comes in 15 and 20-ton units, plus water chiller in 20-ton units. Mitsubishi offers two gas-engine drive heat pumps: the outdoor unit in 11-and 16-ton sizes; the indoor fan coil unit ranges in size from one to two tons. Mitsubishi models are suitable for larger-scale projects by installing chiller links or multiple units coupled to form an integrated array. Yazaki and Broad provide gas absorption chillers from 20 to 100 tons for multi-family applications using individual unit zone control. Tecogen provides gas engines for cooling and heating in unit sizes above 30 tons.

Partnering with product manufacturers and distributors, AGCC will locate appropriate sites and arrange for the installation and demonstration of natural gas air conditioning in under-served residential markets outside the LA Basin, multi-family or non-English speaking households defined in the Energy Efficiency Policy Manual and “Statewide Residential Customer Needs Assessment Study”. Demonstration sites will be selected to test and demonstrate the technology’s applicability to specific niches and applications. Potential candidates include large new homes that require sophisticated zoning systems or multi-family housing with zone control and individual metering. AGCC seeks five demonstrations per year.

Small Commercial New Construction

Similar to residential new construction, the same manufacturers provide an array of products to meet numerous applications for small commercial new construction. Robur, Goettl, Mitsubishi Heavy Industries, Yazaki, Broad, Tecogen and emerging manufacturer Cooling Technology have available products ranging in size from three tons to over 100 tons. The focus of this effort is on small commercial projects that can use hybrid/integrated or zone control techniques to reduce energy consumption and peak electrical demand. Projects of less than 40,000 square feet in schools, healthcare, office and small hard-to-reach retail new construction developments qualify under this program element. AGCC expects 76 installations in year one with an increase in year two to 80 units, for a total of 156 small commercial unit installations.

Partnering with product manufacturers and distributors, AGCC will locate appropriate sites and arrange for the installation and demonstration of natural gas air conditioning in under-served small commercial markets outside the LA Basin, small commercial businesses with less than 10 employees, and non-English speaking and commercial building tenants described in the Energy Efficiency Policy Manual. Demonstration sites will be selected to test and demonstrate the technology’s applicability to specific niches and applications. Potential candidates include new construction projects for schools, churches, offices and retail projects that demonstrate sophisticated hybrid/integrated or zoning systems. AGCC seeks five demonstrations per year.

Large Commercial New Construction

Large new construction commercial projects provide the greatest opportunity to improve energy efficiency and peak electrical load reduction. Numerous manufacturers can provide equipment sizes from 100 tons to over 2400 tons to meet large project demands. The AGCC effort will focus on the hybrid/integrated system application in new construction projects over 40,000 square feet. New efficient direct-fired double-effect or steam double-effect gas absorption chillers and gas engine equipment provide owners of the ability to manage and take control of energy costs with new gas cooling techniques. The large commercial users are not familiar with hybrid or integrated systems and reluctant to install this new equipment. Partnering with manufacturers, AGCC expects that 10 installations can be achieved per year.

Partnering with product manufacturers and distributors, AGCC will locate appropriate sites and arrange for the installation and demonstration of natural gas air conditioning in commercial markets to further demonstrate new efficient technology coupled with an integrated building cooling, heating and power (BCHP) system. Demonstration sites will be selected to test and demonstrate the technology's applicability to specific niches and applications. Potential candidates include large new construction projects for schools, hospitals, offices and large retail projects that demonstrate sophisticated integrated or BCHP systems. AGCC seeks five demonstrations per year.

Process for Payment of Incentives

Residential New Construction

Incentives are provided for new construction residential developments that install new natural gas air conditioning chillers. The incentive is to encourage builder developers to design residential dwellings with zone control techniques using gas cooling. Developers who design and install gas cooling with zone control in all units within the development receive \$200/ton plus manufacturer incentive participation. Maximum participation per developer per year is 100 units. All units must be located in southern California. Because manufacturer prices get marked up at each transfer point in the distribution chain, the \$1,000 incentive per five-ton unit is expected to translate into a \$1,500 savings to the developer and new homeowner.

Some developers may only provide gas air conditioning as an option to new homeowners. Consumers that select the gas air conditioning option provided through participating builders will have a choice of three options to save on their purchase:

1. Select an extended ten-year warranty program to ensure long-term reliable service;
2. Select an annual maintenance service program for five years to ensure the most efficient operation of their air conditioning unit; or
3. Select a cash incentive of \$200/ton plus manufacturer incentive participation.

Small Commercial New Construction

Incentives are provided for new construction small commercial developments less than 40,000 square feet that install new natural gas air conditioning chillers. The incentive is to encourage builder/developers to design commercial properties with hybrid, integrated or zone control techniques using gas cooling. Developers who design and install gas cooling that incorporate these techniques within the development receive \$200/ton plus manufacturer incentive participation. Maximum participation per developer per year is 300 tons. All properties must be located in southern California. Because manufacturer prices get marked up at each transfer point in the distribution chain, the \$200 incentive per ton is expected to translate into a \$300 savings per ton to the developer and new owner.

Some developers may only provide gas air conditioning as an option to new owners. Owners that select the gas air conditioning option provided through participating builders will have a choice of three options to save on their purchase:

1. Select an extended ten-year warranty program to ensure long-term reliable service;
2. Select an annual maintenance service program for five years to ensure the most efficient operation of their air conditioning unit; or
3. Select a cash incentive of \$200/ton plus manufacturer incentive participation.

Large Commercial New Construction

Incentives are provided for new construction large commercial developments over 40,000 sq. ft. that installs new natural gas air conditioning chillers. The incentive is to encourage builder/developers/owners to design commercial properties with hybrid, integrated techniques using gas cooling. Developer/owners who design and install gas cooling that incorporates these techniques within the development receive \$200/ton plus manufacturer incentive participation. Maximum participation per development per is 300 tons. All properties must be located within the service territory of SoCalGas. Because manufacturer prices get marked up at each transfer point in the distribution chain, the \$200 incentive per ton is expected to translate into a \$300 savings per ton to the developer/owner.

Owners that select the gas air conditioning will have a choice of three options to save on their purchase:

1. Select an extended warranty program for up to ten years to ensure long-term reliable service;
2. Select an annual maintenance service program for up to five years to ensure the most efficient operation of their air conditioning unit; or

3. Select a cash incentive of \$200/ton plus manufacturer incentive participation up to 300 tons per project.

Coordination with Other Programs

AGCC will continue to collaborate with the Department of Energy, through its Building Combined Heat and Power Program (BCHP). AGCC will also partner with American Society for Healthcare Engineering, Council for Educational Facility Planners International (CEFPI), manufacturers, and Oak Ridge National Lab to further the commercialization of advanced cooling technologies. AGCC will continue working with the California Energy Commission and investor owned utilities to support the development of “Time Dependent Valuation” of energy codes for adoption statewide. In cooperation with investor owned utilities, AGCC supports the statewide nonresidential new construction “Savings By Design” program to increase energy efficiency in commercial facilities. Principal efficiency measures outlined in the savings by design program that encourage an owner or design team to incorporate energy efficiency measures and systems into a particular project during the planning process are a practical means to incorporate efficiency.

Targeted Customers

This program element targets natural gas air conditioning manufacturers, distributors, vendors, the commercial design community, residential market builders, developers and HVAC dealers and installers. Particular attention will be paid to the members of the commercial design community, specifically mechanical engineers and architects. Program planners believe this group to be the most influential in specifying natural gas air conditioning equipment in significant complete building renovation and new construction of commercial projects.

Customer Sizes Targeted

While upstream market interventions could potentially benefit customers of any size, in practice, the bulk of the benefits are expected to accrue to small commercial and residential customers.

In the residential sector, the primary target market will be newly constructed homes greater than 2,500 square feet. At these larger sizes, zone control systems become cost-effective. Also buyers of larger homes are more likely to be attracted to the gas air conditioning system's premium quality.

The small commercial sector program focus is on establishments requiring less than 100 tons of cooling, that represents a practical limit for chiller-linked arrays or of gas-engine heat pumps installations.

Large commercial focus is on developments of over 100 tons of cooling that can easily adopt gas air conditioning hybrid or integrated systems into new developments.

Geographic Area

The downstream program elements will be targeted to southern California. The counties are Kern, San Bernardino, Riverside and Imperial counties with climate zones of 10 or greater.

While upstream elements could, in principle, serve a much broader geographic area, in practice interactions with manufacturers and distributors are expected to impact primarily the southern California market, since that region is currently the focus of their attention. In addition, manufacturers and distributors will be required to document that equipment sales went to southern California in order to earn financial incentives.

Equity Considerations

Hybrid and integrated gas-electric cooling systems will provide particular benefits to customers in areas with high cooling loads. The highest cooling loads occur in the desert portions of the SoCalGas service territory. The Commission has identified customers outside the Los Angeles Basin as hard-to-reach and worthy of special outreach efforts.

While the hard-to-reach market contributes funds to support program activities, they may find it difficult to participate in natural gas cooling programs due to barriers such as business size or category, capital constraints, geographic location, construction knowledge, project schedule and lease disincentives. AGCC will put in place the infrastructure and delivery channels to deliver programs to customers throughout southern California, regardless of geographic location.

Summary

AGCC program cost-effectiveness calculations conform with all of the CPUC-adopted policies applicable to the 2002-2003 programs. The Total Resource Cost (TRC) and Participant Test ratios for this program, calculated pursuant to the CPUC's requirements, are 1.10 and 1.30, respectively. The energy savings attributed to this program are 33,600,000 kWh, the peak electric demand impact is 17,900 kW, and the gas savings impact is (3,200,000) therms.

Requirements

In Decision (D.) 01-11-066, the CPUC approved the Energy Efficiency Policy Manual (EPPM). The EPPM includes requirements for the development of prospective cost-effectiveness values for programs funded by electric and gas public goods charge (PGC) funds. Specifically, Chapter 4 of the EPPM requires that each proposal present prospective results of the TRC and Participant Test, pursuant to the requirements of the Standard Practice Manual.

D. 01-11-066 and the EPPM require that each proposal utilize the cost-effectiveness inputs specified in the EPPM for calculating cost-effectiveness for the 2002-2003 programs. The values included in the EPPM include net-to-gross ratios, measure lives, avoided costs, discount rate, and recommendations for incremental measure cost and energy savings estimates. The values described in the EPPM have been utilized consistently in the development of the AGCC program's cost-effectiveness calculations for 2002-2003.

The EPPM's Appendix A – the Program Technical Proposal – requires that this Section 4 of the Program Technical Proposal include the documentation of all data sources and an electronic spreadsheet/workbook file containing projected electricity (kWh), peak demand (kW), and gas (therms) savings for each program. This information is provided later in this section, and provides measure-specific cost-effectiveness determinants.

Cost-Effectiveness Inputs

Program Administrative Costs

Program administrative costs include all non-incentive costs as reported in the program budget. For cost effectiveness calculation purposes, 2003 program admin costs are not discounted, in the interest of modeling conservatism.

Avoided Costs

The avoided costs utilized in the calculations represent the avoided costs as recommended in the EEPM. One additional year of data – for 2022 – has been added to the EEPM time series, to cover FY 2003 installations for measures that have 20-year equipment lives. Values for 2022 have been set equal to those values specified for 2021.

The avoided costs utilized in the cost-effectiveness analysis of the programs herein are only applicable to the appropriate development of energy efficiency programs for 2002-2003. The factors utilized in the development of these avoided costs were adopted specifically to reflect an appropriate value for the reduced energy and capacity savings due to energy efficiency programs. As such, these costs should not be used in any other context, and should also be reviewed for future use in energy efficiency program planning and evaluation.

Participant Test Issues

Chapter 4 of the EEPM requires that each program proposal prospectively summarize the cost-effectiveness results of the TRC and Participant Tests, pursuant to the requirements of the Standard Practice Manual. Long-term forecast electric and gas rates are not provided in the EEPM to calculate the Participant Test. As a pragmatic simplifying approach, the AGCC program has utilized the total electric and gas avoided costs streams as stated in Table 4.3 of the EEPM as the long-term forecast electric and gas rates for calculating the Participant Test.

Net-to-Gross Ratio

Gross energy savings are considered to be the savings in energy and demand seen by the participant at the meter. Net savings are assumed to be the savings that are attributable to the program. That is, net savings are gross savings minus those changes in energy use and demand that would have happened even in the absence of the program (free riders). The net-to-gross ratio is a factor that is applied to gross program load impacts to convert them into net program load impacts. This factor is also used to convert gross measure costs into net measure costs.

The Net-to-Gross ratios utilized in the 2002-2003 program cost-effectiveness calculations are set at the levels recommended in the EEPM. Specifically, all measures use net to gross ratios of 1.00, per the EEPM for gas AC measures.

Effective Useful Life

The Effective Useful Life is the length of time (years) for which the load impacts of an energy efficiency measure are expected to last.

The useful life estimates are also based upon the amounts recommended in the EEPM. Measure-specific values are 20 years (for gas AC units). An economic advantage for gas cooling has not been included in the calculations to reflect the added life of the equipment over electrical unit life expectancy.

Information & Education Outreach

There is no estimate of energy, capacity, therm savings, or cost effectiveness for this statewide proposal. Although it is AGCC's intention to encourage the efficient utilization of electricity and natural gas, any calculations performed for the 2002-2003 program cost-effectiveness would utilize energy, capacity, and therm savings estimates for measures and programs for which there is a relatively high degree of speculation. The lack of energy savings, capacity savings, therm savings, resource benefits, or a TRC or Participant Test NPV or BCR ratio for any particular program (i.e., information programs) should not imply that this program does not promote energy efficiency, nor should it imply that there is not an impact to the customer's use of electricity or natural gas or a corresponding impact to the electricity or natural gas system. However, pursuant to the CPUC's approval of the Energy Efficiency Policy Manual, this proposal for an information-only program is not reasonably expected to provide an estimate of energy savings.

Units, Energy and Capacity Savings (per unit), Incremental Measure Cost (per unit), and Program Incentive Cost (per unit)

These values are presented by equipment market segment for the following segments: single family, multi-family, small commercial, and large commercial. Each segment's data are described in turn.

Program Performance Goals

Energy and Peak Demand Savings Targets

To encourage superior program delivery for all rebate programs, the Commission Energy Efficiency Policy Manual requires that the last program payment be paid after final program evaluation based on achieving savings targets. The following table provides the proposed energy savings and demand reduction targets for this rebate program. These predetermined energy and peak demand savings targets include both actual and committed savings.

Energy Savings And Demand Reduction Targets

Southern California Natural Gas Cooling Program

	Projected
	Savings
Energy (kWh):	33,600,000
Demand (kW):	17,900
Gas (Therms):	-3,200,000

Average % of Goal

Other Proposed Benchmarks

The primary performance indicators for this program are HVAC contractor awareness of small nonresidential gas cooling options and residential builder community and HVAC dealer/installer awareness of energy-efficient natural gas cooling system installation and maintenance technology and protocol. The metric for this indicator will be

- Number of contractors certified by the manufacturers
- Number of demonstration sites successfully installed in southern California
- Number of builders and HVAC dealers or installers attending seminars
- 1200 Architect and Mechanical Engineers contacted and briefed
- 3 Web-based programs place on-line
- Number of design and manufacturer specification manuals provided to A&E's and dealers

Evaluation Objectives

The program evaluation will achieve the following objectives:

- Measure level of energy and peak demand savings achieved
- Measure cost-effectiveness
- Provide ongoing feedback, and corrective and constructive guidance regarding the implementation of programs
- Measure indicators of program effectiveness, including testing of the assumptions that underlie the program theory and approach
- Assess the overall levels of performance and success of programs
- Inform decisions regarding compensation and final payments
- Help to assess whether there is a continuing need for the program

Approach to Evaluating Program Success

The program evaluation will include a measurement and verification component that will produce estimates of energy impacts and program cost-effectiveness, which will serve to determine the amount of the program's performance-based compensation and final payment. The M&V approach to accomplishing these objectives is described in detail in a later section. The evaluation approach to accomplishing the remaining evaluation objectives is described as follows.

Ongoing feedback

Twice during program implementation, evaluators will interview participating manufacturers, distributors, retailers, and builders. Interviews will focus on program operational details to ascertain which elements are working as designed and which need modification. Interviews will occur at six months and eighteen months from program initiation. For budgeting purposes, 30 interviews per cycle are assumed, for a total of 60 interviews.

Program effectiveness

Documentation of the program's performance goals, in conjunction with ongoing feedback from trade allies, will provide clear indicators of program effectiveness.

Assessment of overall program performance

The program tracking system will document all activities, including inputs required to calculate energy impacts. The tracking system will also document the various metrics identified as program performance indicators, specifically

- Number of contractors certified by the manufacturers

- Number of demonstration sites successfully installed in southern California
- Number of builders and HVAC dealers or installers attending AGCC sponsored seminars
- Number of Architect and Mechanical Engineers contacted and briefed
- Number of Web-based programs place on-line
- Number of design and manufacturer specification manuals provided to A&E's and dealers

Assessment of continuing program need

Continuation of the program is justified if (a) the program has reasonably low rates of free-ridership; (b) facility energy efficiency improvements are cost effective; and (c) a relatively large portion of the target market remains to be served. Given the almost total absence of gas cooling and hybrid cooling systems currently in place in the target markets, free ridership is expected to be particularly low. The measurement and verification activities will provide cost-effectiveness results. To gauge the size of the market remaining to be served, estimates of market share will be derived by comparing documented numbers of HVAC units incented under the program with publicly available industry reports of overall construction activity within the same time frame.

Evaluation activities

Anticipated evaluation activities can be summarized as follows:

1. Prepare a detailed evaluation, measurement and verification plan;
2. Prepare six quarterly reports documenting program budgets and expenditures, projects funded, and the ex ante estimate of energy savings and peak demand reductions associated with the program expenditures;
3. Field two rounds of phone interviews to approximately 30 primary decision makers representing key participating manufacturers, distributors, retailers, contractors, and builders;
4. Conduct measurement and verification activities, as described below; and
5. Prepare a final report documenting evaluation results relating to each evaluation objective, energy impacts as estimated by M&V activities, program cost effectiveness, and proposed final compensation amount.

Baseline Information

A wealth of publicly available market data and market research results is available, making further baseline market research unnecessary. References to relevant sources include:

- Air-Conditioning and Refrigeration Institute (undated), *1999 Statistical Profile of the Air-Conditioning, Refrigeration, and Heating Industry*, Arlington, Virginia.
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- Gas Technology Institute (2001), *Baseline Projection Data Book*, Vol. 1 and 2, Gas Technology Institute, Des Plaines, Illinois.
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- NAHB Economics, Mortgage, Finance & Housing Policy Division and Whirlpool Corporation (2001), *The Next Decade For Housing*, National Association of Home Builders
- NAHB Research Center (1989a), *Historical Review of Housing Innovation*. Prepared for Martin Marietta Energy Systems, Inc. (Subcontract No. 86X-SC895C). Upper Marlboro, Maryland.
- NAHB Research Center (1989b), *Criteria for Evaluation of Emerging Housing Technologies*. Prepared for Martin Marietta Energy Systems, Inc. (Subcontract No. 86X-SC895C). Upper Marlboro, Maryland.
- NAHB Research Center (1989c), *Diffusion of Innovation in the Housing Industry*. Prepared for U.S. Department of Energy. Upper Marlboro, Maryland.
- Opinion Dynamics Corporation (1999), *Residential HVAC Market Transformation Market Characterization and Baseline Study*, prepared for Pacific Gas and Electric Company, San Francisco, California.
- Pacific Gas and Electric Company (2001), *2002 Energy Efficiency Program Selection R. 01-08-028, Energy Efficiency Proposal, Statewide Nonresidential New Construction, Savings by Design*, San Francisco, California
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Energy Efficiency Measure Information

Single-Family Residential

The program expects to provide incentives for approximately 250 5-ton units, totaling 1,250 tons. Equipment specifications are as follows:

Residential Single-family Equipment Specifications

	<u>Robur</u>	<u>Cooltec</u>
Tonnage	5 RT	5 RT
COP	0.62	0.68
kW Equivalent ¹	6.05 kW	6.05 kW
Model Number	ACF60	CoolTec 5
Typical Building Setting	Residential SFH over 2,500 sq. ft	
Typical Climate	San Bernardino & Riverside counties - 1,700 Annual Full Load Cooling Hours for Climate Zone 10 ²	

Performance and cost assumptions are as follows:

Therm Use per Unit: 89,000 Btuh/5 RT³

Annual Avoided kWh per Unit per Year: 1,250 RT x 1,700 hours x (1.21 kW/ton¹ – 0.15 kW/ton³) = 2,252,500 kWh; at 250 units, 9,010kWh / unit

Annual Avoided kW per Unit per Year: 1,250 RT x (1.21 kW/ton¹ – 0.15 kW/ton³) x (1 MW / 1000 kW) = 1.325 MW; at 250 units, is 5.3 kW/unit

Gas Energy Usage: (1,250 RT x 1,700 hours x (17.8 cu ft³/ton x 75% Diversity)) x (1 Th / 100 cu ft) = 283,700 Th; at 250 units, is 1,134 Th

Rebate: \$200 per Ton @ 5 Tons/unit = \$1,000/unit; excludes \$50/ton manufacturer rebate (\$250/unit)

Unit Cost:

Gas AC (Includes unit, parts, and installation) ⁴	\$8,850
Less Mfr. Rebate	(250)
Electric AC (Includes unit, parts, and 3 zone installation) ⁴	<u>\$ 8,000</u>
Difference	\$ (600)

Rebate @ \$200/ton	<u>\$(1,000)</u>
Total Investment	\$ (400)

Multi-Family Residential

The program expects to provide incentives for five demonstration projects in multi-family projects, averaging 100 tons per project, for a total of 500 tons. Equipment specifications are as follows:

Residential Multi-family Equipment Specifications

	Robur	Cooltec	Goettl	Yazaki
Tonnage	25 RT	25 RT	20 RT	100
COP	0.62	0.68	1.3	1.020
kW Equivalent ¹	30 kW	30 kW	24.2 kW	120 kW
Model Number	ACF60	Cooltec 5	NGED2400	CH-K100
	Chiller-Link	Multi-Array		
Typical Building Setting	Residential multi-family new construction projects			
Typical Climate	San Bernardino & Riverside, Kern counties - 1,500 Annual Full Load Cooling Hours for Climate Zone 10 ²			

Performance and cost assumptions are as follows:

Annual Avoided kWh per Year: 500 RT x 1,700 hours x (1.21 kW/ton¹ – 0.025kW/ton⁶) = 1,007,250 kWh; at 5 units, is 201,000 kWh/unit

Annual Avoided kW per Year: 500 RT x (1.21 kW/ton¹ – 0.025kW/ton⁶) x (1 MW / 1000 kW) = 0.59 MW; at 5 units, is 118.5 kW/unit

Gas Energy Usage: (500 RT x 1,700 hours x (12 cu ft⁶/ton x 85% Diversity)) x (1 Th / 100 cu ft) = 86,700 Th; at 5 units, is 17,000 Th/unit

Rebate: \$200 per Ton @ 100 Tons/unit = \$20,000; excludes \$50/ton manufacturer rebate (\$5,000/unit)

Unit Cost:

Gas AC 100 RT (Includes unit, parts, and installation) ⁶	\$147,000
Less Mfr. Rebate	(5,000)
Electric AC 100 RT (Includes unit, parts, and installation) ⁶	<u>\$ 100,000</u>

Difference	\$ 42,000
Rebate @ \$200/ton	<u>\$20,000</u>
Total Investment	\$22,000

Small Commercial

The program expects to provide incentives for 76, 50-ton units, totaling 3,800 tons. Equipment specifications are as follows:

Small Commercial Equipment Specifications

	Broad USA	Goettl	Mitsubishi	Yazaki
Tonnage	50 RT	50 RT	50 RT	50 RT
COP	1.33	1.3	1.1	1.02
kW Equivalent ¹	60.5 kW	60.5 kW	60.5 kW	60.5kW
Model Number	50TR	NGED2400	GH180N-U	CHV 50
Typical Building	Office, Healthcare, Schools, Computer Center and small hard-to-reach retail under 40,000 sq. ft			
Typical Climate	San Bernardino, Riverside, Kern counties - 1,800 Annual Full Load Cooling Hours for Climate Zone 10 ²			

Performance and cost assumptions are as follows:

Average Gas Use per Unit: 9 CF per ton⁸

Annual Avoided kWh per Unit: 3,800 RT x 1,800 hours x (1.21 kW¹ – 0.05 kW⁸) = 7,934,000 kWh; at 76 units, is 104,000 kWh/unit

Annual Avoided kW Unit: 3,800 RT x (1.21 kW/ton¹ – 0.05 kW/ton⁸) x (1 MW / 1000 kW) = 4.4 MW; at 76 units, is 58 kW/unit

Gas Energy Usage: (3,800 RT x 1,800 hours x 9 cu ft⁸/ton) x (1 Th / 100 cu ft) = 615,600 Th; at 76 units, is 8,100 Th/unit

Rebate: \$200 per Ton @ 50 Tons/unit = \$10,000/unit; excludes \$50/Ton manufacturer rebate (\$2,500/unit)

Unit Cost:

Gas AC (Includes unit, parts, and installation) ⁸	\$54,200
Less Mfr. Rebate	(2,500)
Electric AC 50 RT (Includes unit, parts) ⁸	<u>\$ 26,400</u>

Difference	\$ 25,300
Rebate @ \$200/ton	<u>\$10,000</u>
Total Investment	\$15,300

Large Commercial

The program expects to provide incentives for 15 200-ton units, totaling 3,000 tons. Equipment specifications are as follows:

Large Commercial Equipment Specifications

	Broad USA	Dunham Bush	York
Tonnage	200 RT	100 RT	200 RT
COP	1.33	1.2	1.01
kW Equivalent ¹	242 kW	242 kW	242 kW
Model Number	200TR	WCTA100	YPC DF 16F
Typical Building	Institutions, Healthcare, Computer Center and Offices over 40,000 sq. ft		
Typical Climate	San Bernardino, Riverside, Kern counties – 2,000 Annual Full Load Cooling Hours for Climate Zone 10 ²		

Performance and cost assumptions are as follows:

Average Gas Use per Unit: 9 CF per ton

Annual Avoided kWh per Unit: 3,000 RT x 2,200 hours x (0.84 kW¹ – 0.05 kW⁸) = 5,214,000 kWh; at 15 units, is 348,000 kWh/unit

Annual Avoided kW per Unit: 3,000 RT x (0.84 kW/ton¹ – 0.05 kW/ton⁸) x (1 MW / 1000 kW) = 2.370 MW; at 15 units, is 158 kW/unit

Gas Energy Usage: (3,000 RT x 2,200 hours x 9 cu ft⁸/ton) x (1 Th / 100 cu ft) = 594,000 Th; at 15 units, is 39,600 Th/unit

Rebate: \$200 per Ton @ 200 Tons/unit = \$40,000/unit; excludes \$50/Ton manufacturer rebate (\$10,000/unit)

Unit Cost:

Gas AC (Includes unit, parts, and installation) ⁸	\$154,600
Less Mfr. Rebate	(10,000)
Electric AC 200 RT (Includes unit, parts) ⁸	<u>\$ 99,000</u>
Difference	\$ 45,600
Rebate @ \$250/ton	<u>\$40,000</u>
Total Investment	\$ (5,600)

Source Documentation

¹ California Energy Commission (2001), *2001 Energy Efficiency Standards for Residential and Non-Residential Buildings* (Publication No. P 400-01-024) Los Angeles, California

² Air-Conditioning and Refrigeration Institute (1994), *1994 Standard for Unitary Air-Conditioning and Air-Source Heat Pump Equipment* (Standard 210/240). Arlington, Virginia

³ Cooling Technologies (undated), *Cooltec 5tm Gas-Fired Cooling* (Specification Sheet). Toledo, Ohio

⁴ Ryan, William (undated), *Unitary Market Briefing Book*, University of Illinois at Chicago, Chicago, Illinois

⁵ Cooling Technologies (undated), *Cooltec 5tm Gas-Fired Cooling* (Specification Sheet). Toledo, Ohio

⁶ Yazaki (undated), *Gas Fired Double-Effect Chiller-Heater* (Specifications Sheet). Farmers Branch, Texas

⁷ Broad USA (undated), *Broad Spectrum DFA/IFA* (Specification Sheet). Hackensack, New Jersey

⁸ Broad USA (undated), *Broad Spectrum DFA/IFA* (Specification Sheet). Hackensack, New Jersey

⁹ Ryan, William (undated), *The Rational for Peak Electrical Demand Incentives*; University of Illinois at Chicago, Chicago, Illinois, and Consulting-Specifying Engineering (August 2001), *Time to Rethink Electric-Only Power*, Cahners Business Information, Oak Brook, Illinois

¹⁰ Cooling Technologies (undated), *Cooltec 5th Gas-Fired Cooling* (Specification Sheet). Toledo, Ohio and Robur Corporation (1999), *ACF60 5 Ton Chiller, Gas Absorption Chiller* (Specification Sheet, Form No. SL2001) Evansville, Indiana

Measurement and Verification Approach

The measurement and verification approach will follow methodology option D, as outlined in the *International Performance Measurement and Verification Protocol* (IPMVP). Option D, “Calibrated Simulation,” calls for savings to be determined through simulation of the energy use of the component of the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility.

For this program, direct calibration to site-specific energy consumption may not be possible because construction projects may not be completed and operational in time to generate sufficient load data. As a proxy, we will test the reliability of proposed simulation models by comparing simulation results to metered data from demonstration projects.

Measurement and verification activities can be grouped into three tasks:

1. Prepare a measurement and verification plan;
2. Obtain field data and associated project documentation; and
3. Model program impacts.

Each task is described below.

Measurement and Verification Plan

The evaluation plan will include a detailed measurement and verification component. For each measure to be implemented under the program, the plan will describe all algorithms to be used in calculating energy impacts, specify all deemed savings inputs, provide documentation for deemed savings values, and describe procedures for measuring all input parameters not covered in the set of deemed savings values. Finally, the plan will establish protocols for M&V tasks 2 and 3, project documentation review and follow-up field inspections.

Field Data Acquisition

As part of ongoing field activities, the program will document all cooling projects rebated. Because the program will involve a close collaboration between AGCC, manufacturers, and distributors, we expect to have direct access to construction project information in many cases, despite the fact that incentives will be paid upstream at the manufacturer level. From project planning documents, we will obtain specifications of actual cooling systems. By interviewing project general contractor, we will determine the conventional system that most likely would have been installed in the absence of the program. Expected operating schedules for key energy-using equipment will be determined via these interviews as well. This information will all be summarized in a project report. The measurement and verification plan will describe procedures for extrapolating impacts from fully documented projects to those projects for which we lack complete documentation.

Impact Modeling

For 10 of the 15 large commercial projects envisioned, the program will develop DOE-2 models as part of project implementation. For evaluation purposes, our efforts will focus on reviewing

model inputs to verify that assumptions are consistent with as-built conditions (to the extent those conditions are known at the time of the evaluation). For projects lacking DOE-2 results, we will model HVAC energy usage using Gas Cooling Guide Pro, a DOE-2-based software tool developed by InterEnergy that allows for simplified data entry and explicitly addresses gas cooling impacts.

For residential and small commercial projects, we will model the energy impacts of gas cooling using a bin calculation method. This method estimates electric and gas consumption for both the actual gas/hybrid system and for the hypothetical base case. The model incorporates typical-meteorological-year weather data in the form of the number of hours per year the normal temperature falls into each 5-degree temperature bin. Using equipment-specific performance data that plot performance as a function of temperature, the model calculated cooling load and total cooling energy for each temperature bin. For unique project applications that do not lend themselves to standard bin-method calculations, we will develop specific models using Gas Cooling Guide Pro. In total, we will estimate models for approximately 10% of rebated residential and small commercial projects. We will calculate impacts per-ton by climate zone and then extrapolate these results to remaining rebated projects.

Field data review

As part of ongoing field activities, the program will document all measures implemented. In cases where existing energy-using equipment is removed and replaced with more efficient equipment (e.g., lighting systems) the energy efficiency level of the old equipment will be documented. Operating schedules for key energy-using equipment will be determined via interviews with facility managers and staff. This information will all be summarized in a project report.

In addition to project reports to document inputs for energy calculations, the program will maintain a comprehensive tracking system for cost accounting purposes. The program tracking system includes procedures, policies, protocols, forms, data entry and the data storage methods. The foundation of this system is a database that tracks the following information:

- Names, addresses, and contact information of participating facilities
- Inventory of existing measures eligible for retrofit
- Types of improvements made at each participating facility and associated costs
- Customer satisfaction data

As part of the measurement and evaluation, staff will review all project reports and tracking system data. Reviews will check for consistency between reported project equipment and materials and invoiced quantities, verify proper application of engineering algorithms specified in the M&V plan, and check for proper calculation of results. Any errors will be corrected and corrections will be documented.

On-site inspections

In step 2, M&V activities verified that claimed savings are consistent with documentation on file and that calculation methods specified in the M&V plan were properly applied. In

step 3, the M&V team will further verify that documentation on file is consistent with conditions in the field. For this task, the M&V team will randomly select 10% of the projects for on-site inspection. Inspectors will visit each sampled site and verify that measures documented in the project file were actually installed and functioning properly. Any discrepancies will be documented and estimated energy impacts will be revised accordingly.

Implementers' Qualifications

The American Gas Cooling Center (AGCC) was formed in 1989 as an autonomous organization under the American Gas Association (A.G.A.) umbrella. The Cooling Center incorporated on January 1, 1994, to facilitate partnerships and strengthen relationships with the Department of Energy, Department of Defense, American Gas Association, Gas Technology Institute, and gas cooling equipment manufacturers and natural gas utilities.

The AGCC Board of Directors is composed of one designated voting representative from each of the AGCC's corporate members, usually an officer of the company. The AGCC Technical Advisory Council is composed of the four support committee chairs and the Manufacturers Advisory Chair who recommend programs to the Board of Directors and annually review programs and activity.

The AGCC Manufacturer Advisory Committee, a leadership council, is composed of Manufacturer Member delegates who oversee and recommend programs and activities to support their marketing and sales efforts. The MAC Committee reports to the AGCC Board of Directors.

The AGCC has four committees supporting the AGCC's commercialization efforts and provides significant input to the Advisory Board.

[Chiller Committee](#)

[Unitary Products Committee](#)

[Humidity Control Committee](#)

[Manufacture Advisory Council](#)

Purpose and Goals

The American Gas Cooling Center mobilizes members to place natural gas cooling, zone control, hybrid, integrated cooling systems, distributed generation, and cooling, heating, and power technologies into the forefront of the global marketplace. America's energy share, economic well being, and environmental position are strengthened through the AGCC's unified efforts.

The AGCC

- acts as the gas industry focal point for manufacturers of gas cooling systems, distributed generation, and cooling, heating, and power products
- promotes sales of gas cooling systems, distributed generation, and cooling, heating, and power technologies by acting as a catalyst for technology transfer or emerging technologies

- secures support from gas industry leaders to pursue market opportunities
- accelerates acceptance of energy efficient gas cooling, integrated cooling systems, distributed generation, and cooling, heating, and power technologies through far reaching market entry programs
- Maintains a strong voice to shape a fair regulatory climate.

Strengthening Strategies

The AGCC's continued effectiveness in acting as a gas cooling, integrated cooling systems, distributed generation, and cooling, heating, and power systems catalyst for the industry hinges on four market support strategies.

Market Development

Assist equipment manufacturers, energy service providers and utilities to develop markets for natural gas cooling, integrated cooling systems, distributed generation, and cooling, heating, and power systems.

Technology Commercialization

Support manufacturers', utilities' and other organizations' efforts to commercialize new gas cooling, integrated cooling systems, distributed generation, cooling, heating, and power technologies that are responsive to customer and market needs.

Communications

Position AGCC as a resource and clearinghouse for gas cooling, dehumidification and refrigeration information for its membership and the industry.

Advocacy

Aggressively support codes and standards, legislation and regulations that promote a "level playing field" and encourage the development and installation of gas cooling products.

AGCC maintains an online database of U.S. gas cooling, integrated cooling, distributed generation, and cooling, heating, and power equipment installations. This database is available to members only through our web site.

AGCC keeps members and the media informed about gas cooling, integrated cooling systems, distributed generation, and cooling, heating, and power systems advances through its weekly email messages and mailings.

AGCC offers resources targeting three distinct areas:

- Sales and Marketing (Workshop modules, Magazine)
- Technology (Technical Manuals, Workshop modules, Studies), and

- Public Policy Issues (Magazine).

AGCC keeps natural gas cooling, integrated cooling systems, distributed generation, equipment and issues in the spotlight at energy related trade shows and expositions across the country and internationally.

The AGCC has become the world's leading authority on natural gas cooling, integrated cooling systems, distributed generation, and cooling, heating, and power technologies. AGCC offers a wide selection of expert information on relevant equipment, commercialization practices, installation trends, and public policy issues. Information is available to building owners, architects, engineers, and gas industry and HVAC technical sales and service representatives through publications and workshop packages. Real-time news is available from the World Wide Web.

Frontier Associates

For this program, Frontier Associates will provide regulatory reporting services and will direct measurement and evaluation activities. The firm brings to the project broad experience with all facets of energy efficiency program design, implementation, and evaluation.

Established in 1999, Frontier quickly became the leading energy efficiency consultant to investor-owned utilities in Texas. Now, throughout the country, Frontier is an important consultant to electricity retailers, electricity distribution companies, power generators, natural gas distributors, electricity and gas consumers and manufacturers of energy efficiency related products.

Frontier's growth and success is founded on our unparalleled knowledge of market and regulatory issues facing utility companies, business and industry, regulatory bodies, all levels of government, and consumers, as evidenced by our diverse client base and professional staff. Frontier Associates delivers its consulting expertise to clients in each sector of the energy industry:

- **Utilities:** Frontier Associates works with electric and gas utilities on a variety of topical areas including sales and marketing, program design and evaluation and pricing. Our capabilities are well suited to either the regulated or competitive side of today's utility business.
- **Commercial and Industrial Customers:** Frontier Associates provides a broad range of energy use and procurement services to its C&I clients, ranging from load profiling to pricing options to developing bids into utility or state sponsored efficiency projects.
- **Allied Industries:** Manufacturers, distributors and retailers are affected by a number of utility and regulatory initiatives to promote higher efficiency products. Frontier Associates provides consulting services to allied industry clients on how to prosper through participation in these programs.

Designer Information Services

Founded in 1963, Designer Information Services (DIS) is a professional company that provides direct interface with architects & specifiers. DIS currently conducts over 7200 architectural presentations a year in California, Nevada, Oregon, Washington, Illinois and Wisconsin. Over the past 8 years, DIS has implemented various energy resource programs for both the Southern California Gas Company and Southern California Edison. Our resources, knowledge, and experience will enable the American Gas Cooling Center to effectively communicate the advantages of gas air conditioning and help to stimulate an increase of use in Southern California. Our work will identify qualified project opportunities while providing feedback helpful for analysis of the Southern California marketplace.

Field Contact Personnel

Field contact with developers, builders, dealer and installers, and consumers will require several different disciplines to accomplish the objectives outlined in this proposal. AGCC will contract with experts in the required fields to assure the program success with A&E, dealers, builders and consumers. The following individuals have been identified to complete these tasks:

Dan Marostica, Gas Industry Consultant

Provides technical and marketing expertise gained from thirty-year employment with the nations largest natural gas distribution company, the Southern California Gas Company. Offers practical solutions to a wide range of problems and issues. Highly skilled in complex analysis, coupled with excellent verbal and written communications.

Ying Yu, Conservation Technology Inc.

Provides extensive technical experience with proper installation and evaluation of natural gas technology as a consulting engineer on numerous projects in southern California. Has practical knowledge and experience with DOE II assessments and other industry computer software tools required used in establish project feasibility.

Gordon Broberg, Gas Industry Consultant

Provides recent experience with gas cooling manufacturers representing them with builders and developers throughout southern California. He was employed by both the gas and electrical utilities in the area and provides first hand knowledge or both systems. His understanding of gas/electric systems provides a unique understanding of how hybrid and integrated systems provide consumers the greatest benefit and diversity.

Lionel Bryant, Gas Industry Consultant

Recently supported SoCalGas company natural gas cooling program in southern California before builder developer, dealers and installers. He provides first hand contact to inform and educate dealers and others on the unique aspects of gas cooling. Provided dealers with direct training on gas cooling helping to identify niche market opportunities.

Jerry Cannon, Gas Industry Consultant

Recently supported SoCalGas company natural gas cooling program in southern California before builder developer, dealers and installers, primarily in the Inland Empire. He provides first hand contact to inform and educate dealers and others on the unique aspects of gas cooling. Provided dealers with direct training on gas cooling helping to identify niche market opportunities.

AGCC Personnel

Organizational chart

American Gas Cooling Center



Qualifications

Executive Director

The Executive Director is accountable for all aspects of the operation of the American Gas Cooling Center. Responsibilities include management of personnel, financial stability, program administration, membership attainment, communications, marketing, and overall Center effectiveness. The Executive Director has a Bachelors of Science in Engineering with over 30 years of experience within the utility industry, especially natural gas cooling. He has provided valuable assistance to manufacturers, researchers and utilities to advance state of the art equipment and applications for gas cooling and integrated systems. While at Southern California Gas Co., he was instrumental in designing and building The Energy Resource Center in Downey, California that serves as an icon for energy efficiency and environmental sensitivity in building design. He maintains that the use and application of system integration benefits consumers, gas and electric utilities and manufacturers.

Director Communications

The Director Communications reports directly to the Executive Director and is responsible for driving the Center's marketing and technical programs. Responsibilities include forging selected strategic alliances with outside organizations, development and design of programs that market gas cooling and integrated systems, and supervision and coordination of marketing, membership, and communication activities. Qualifications include an undergraduate degree in Marketing, a record of accomplishment in a similar role at a small- to medium-sized company or trade association, strong written and oral communication skills, and the ability to work with senior officials in the gas industry. Experiences will include strong standards for leadership, public speaking forums and overall executive management qualities.

Director Technology

The Director Technology is responsible for planning, developing, and managing education and technical programs for the Cooling Center. This position would include supervising contractors, organizing and conducting educational workshops, preparing and presenting presentations to outside groups, managing the web site, participating in membership support and recruiting activities, serving as staff executive for technical committees, and reviewing publications for technical accuracy. The Director Technology possess a college degree in engineering, with five years of relevant experience, extensive project management experience, strong contract negotiation skills, strong oral and written communication skills, and strong computer skills.

Manager, Marketing and Member Programs

The Manager, Marketing and Member Programs is responsible for all aspects of the Center's marketing programs. Responsibilities include management of the Center's conference and trades show schedule, development of promotional materials, and membership recruitment and retention. This manager has bachelors of art in business administration, over thirteen years of work experience in the marketing area, and extensive project management experience.

Office Manager

The Office Manager is responsible for all aspects of day to day operation of the office and financial systems. Responsibilities include maintaining accurate financial records, processing material orders, main contact for membership and general public, accurate database information for contacts, provide support as needed to staff, and serve as staff assistant to the Executive Director. The Office Manager has a Bachelors of Science and over eight years experience with financial and administrative duties.

Budget

Proposed Funding Category

Local Cross-Cutting Programs

Budget Summary

The financial requirement for the Natural Gas Cooling Program Proposal has been divided into single and multi-family, small commercial, large commercial and Informational and Education sections. Each section can be viewed separately to determine individual program cost and eventual cost effectiveness. The primary market areas have incorporated certain information and educational material to broaden the awareness of that specific effort, equipment or technique. A broader approach aimed at providing information and educational material to reach larger consumer groups, A&E's and specifiers is included in the Information and Education Outreach section. Materials produced for the outreach program is supportive of the individual sections and designed to reach across business or homeowner traditional boundaries for increased awareness of natural gas cooling options.

Item	Single & Multi-Family Residential	Small Commercial	Large Commercial	Information & Education Outreach	First Year Cost	Second Year Cost	Total Cost
AGCC Administrative Costs							
AGCC Administrative Costs							
Program Development	\$18,000	\$22,000	\$10,000	\$83,000	\$133,000	\$43,000	\$176,000
Management & Administration (Executive Director \$65/hr)	\$7,500	\$7,500	\$2,500	\$15,000	\$32,500	\$32,500	\$65,000
Management & Administration (Technical Director \$52/ hr)	\$20,000	\$20,500	\$8,000	\$32,000	\$80,500	\$80,500	\$161,000
Management & Administration (Staff Support \$32/hr)	\$6,500	\$7,500	\$1,500	\$12,500	\$28,000	\$28,000	\$56,000
Phone Consultations (800)	\$8,000	\$8,500	\$3,000	\$22,500	\$42,000	\$42,000	\$84,000
Conference Exhibit	\$0	\$0	\$0	\$10,000	\$10,000	\$10,000	\$20,000
Travel & Expenses (2 trips plus expenses)	\$2,000	\$4,000	\$2,000	\$6,000	\$14,000	\$14,000	\$28,000
Market Transformation Assessment	\$0	\$17,000	\$0	\$0	\$17,000	\$17,000	\$34,000
Materials & Handling	\$2,000	\$2,000	\$1,000	\$4,000	\$9,000	\$9,000	\$18,000
Sub-Total	\$64,000	\$89,000	\$28,000	\$185,000	\$366,000	\$276,000	\$642,000
Subcontractor							
Briefing Sessions for Builders, Dealers, Owners, Distributors, & Developers	\$30,000	\$30,000	\$6,000	\$7,500	\$73,500	\$73,500	\$147,000
Site Visits	\$25,000	\$22,800	\$9,000	\$0	\$56,800	\$56,800	\$113,600
Phone Consultations	\$17,000	\$29,200	\$17,000	\$3,500	\$66,700	\$66,700	\$133,400
Mechanical Engineer Contacts	\$0	\$45,000	\$10,000	\$0	\$55,000	\$55,000	\$110,000
Dealer Training Sessions	\$8,000	\$8,000	\$0	\$0	\$16,000	\$16,000	\$32,000
Travel and Expense	\$6,000	\$12,000	\$6,000	\$12,000	\$36,000	\$36,000	\$72,000
Reporting Cost - Quarterly Reporting	\$1,000	\$1,000	\$0	\$1,000	\$3,000	\$3,000	\$6,000
Materials & Handling	\$1,000	\$2,000	\$0	\$1,000	\$4,000	\$4,000	\$8,000
Case Studies	\$0	\$0	\$0	\$45,000	\$45,000	\$45,000	\$90,000
Consumer Group Presentations	\$0	\$0	\$0	\$14,000	\$14,000	\$14,000	\$28,000
Technical Support	\$0	\$0	\$0	\$30,000	\$30,000	\$30,000	\$60,000
Sub-Total	\$88,000	\$150,000	\$48,000	\$114,000	\$400,000	\$400,000	\$800,000
Evaluation, Measurement and Verification Costs							
EM&V plan					\$10,000	\$10,000	\$20,000
Quarterly reports (6)					\$5,000	\$5,000	\$10,000
Phone interview guides (5)					\$12,000	\$12,000	\$24,000

